

## WHAT IS CLAIMED IS:

1. A method of generating a multiple of a unit  $U$ ,  $N$  times  $U$ , by a digital circuit, where  $U$  is a rational number and  $N$  is a natural number, comprising the steps of:

storing values  $A$ ,  $B$  and  $C$ , where  $A$ ,  $B$  and  $C$  are natural numbers,  $A > 1$ ,  $B > C$  and  $U = A + C/B$ ,

generating a multiple of  $A$ ,  $N$  times  $A$ , and a multiple of  $C$ ,  $N$  times  $C$ ,

comparing the value  $B$  with the multiple of  $C$ ,

modifying the multiple of  $A$  according to the result of the comparing step; and

outputting the modified multiple of  $A$  as the multiple of  $U$ .

2. The method claimed in claim 1, wherein when the result of the comparing step is that the multiple of  $C$  is equal to or larger than the value  $B$ , the modifying step comprising the steps of:

modifying the multiple of  $A$ ; and

subtracting the value  $B$  from the multiple of  $C$ .

3. The method claimed in claim 1, wherein when the result of the comparing step is that the multiple of  $C$  is equal to or larger than a value  $MB$ , where  $M$  is a predetermined natural number, the modifying step comprising the steps of:

modifying the multiple of  $A$ ; and

subtracting the value  $MB$  from the multiple of  $C$ .

4. The method claimed in claim 1, wherein the  $C/B$  represents a repeating decimal.

5. A method of generating a dependent variable of a periodic function whose independent variable is a multiple of a unit  $U$ ,  $N$  times  $U$ , by a digital circuit, where  $U$  is a rational number and  $N$  is a natural number, comprising the steps of:

storing values  $A$ ,  $B$  and  $C$ , where  $A$ ,  $B$  and  $C$  are natural numbers,  $A > 1$ ,  $B > C$  and  $U = A + C/B$ ;

generating a multiple of  $A$ ,  $N$  times  $A$ , and a multiple of  $C$ ,  $N$  times  $C$ ;

comparing the value  $B$  with the multiple of  $C$ ;

modifying the multiple of  $A$  according to the result of the comparing step; and

extracting a value corresponding to the modified multiple of  $A$  from a function table, which represents relationship between the dependent and independent variables of the periodic function and is previously stored in a memory device, as the dependent variable corresponding to the multiple of  $U$ .

6. The method claimed in claim 5, wherein when the result of the comparing step is that the multiple of  $C$  is equal to or larger than the value  $B$ , the modifying step comprising the steps of:

modifying the multiple of  $A$ ; and

subtracting the value  $B$  from the multiple of  $C$ .

7. The method claimed in claim 5, wherein when the result of the comparing step is that the multiple of  $C$  is equal to or larger than a value  $MB$ , where  $M$  is a predetermined natural number, the modifying step comprising the steps of:

modifying the multiple of  $A$ ; and

subtracting the value  $MB$  from the multiple of  $C$ .

8. The method claimed in claim 5, wherein the  $C/B$  represents a repeating decimal.

9. A digital circuit for generating a multiple of a unit  $U$ ,  $N$  times  $U$ , where  $U$  is a rational number and  $N$  is a natural number, comprising:

first, second and third registers for storing values  $A$ ,  $B$  and  $C$ , respectively, where  $A$ ,  $B$  and  $C$  are natural numbers,  $A > 1$ ,  $B > C$  and  $U = A + C/B$ ;

first and second calculating circuits for generating a multiple of  $A$ ,  $N$  times  $A$ , and a multiple of  $C$ ,  $N$  times  $C$ , respectively;

a subtractor for generating a difference between the multiple of  $C$  and the value  $B$ ; and

a modifying circuit for modifying the multiple of  $A$  according to the output of the subtractor, wherein the first calculating circuit outputs the modified multiple of  $A$  as the multiple of  $U$ .

10. The digital circuit claimed in claim 9, wherein:

the first calculating circuit comprises an accumulator and an adder that adds the value stored in the first register to the value stored in the accumulator; and

the modifying circuit directs the adder to add +1 to its output when the output of the subtractor represents that the multiple of  $C$  is equal to or larger than the value  $B$ .

11. The digital circuit claimed in claim 9, wherein:

the first calculating circuit comprises an accumulator and an adder;

the modifying circuit comprises an adjusting circuit for adjusting the value stored in the first register with reference to a predetermined value, and a selector for selecting one of the outputs of the adder and the adjusting circuit according to the output of the subtractor; and

the adder adds the value stored in the accumulator to the output of the selector.

12. The digital circuit claimed in claim 9, wherein:

the first calculating circuit comprises an accumulator and an adder;

the modifying circuit comprises a fourth register for storing a value which is different from the value  $A$ , and a selector for

selecting one of the values stored in the first and fourth registers according to the output of the subtractor; and

the adder adds the value stored in the accumulator to the output of the selector.

13. The digital circuit claimed in claim 9, wherein the  $C/B$  represents a repeating decimal.

14. A digital circuit for generating a dependent variable of a periodic function whose independent variable is a multiple of a unit  $U$ ,  $N$  times  $U$ , where  $U$  is a rational number and  $N$  is a natural number, comprising:

first, second and third registers for storing values  $A$ ,  $B$  and  $C$  respectively, where  $A$ ,  $B$  and  $C$  are natural numbers,  $A > 1$ ,  $B > C$  and  $U = A + C/B$ ;

first and second calculating circuits for generating a multiple of  $A$ ,  $N$  times  $A$ , and a multiple of  $C$ ,  $N$  times  $C$ , respectively;

a subtractor for generating a difference between the multiple of  $C$  and the value  $B$ ;

a modifying circuit for modifying the multiple of  $A$  according to the output of the subtractor; and

a memory device for storing a function table which represents relationship between the dependent and independent variables of the periodic function and for outputting a value corresponding to the modified multiple of  $A$  on the function table as the dependent variable corresponding to the multiple of  $U$ .

15. The digital circuit claimed in claim 14, wherein:

the first calculating circuit comprises an accumulator and an adder that adds the value stored in the first register to the value stored in the accumulator; and

the modifying circuit directs the adder to add +1 to its output when the output of the subtractor represents that the

multiple of  $C$  is equal to or larger than the value  $B$ .

16. The digital circuit claimed in claim 14, wherein:

the first calculating circuit comprises an accumulator and an adder;

the modifying circuit comprises an adjusting circuit for adjusting the value stored in the first register with reference to a predetermined value, and a selector for selecting one of the outputs of the adder and the adjusting circuit according to the output of the subtractor; and

the adder adds the value stored in the accumulator to the output of the selector.

17. The digital circuit claimed in claim 14, wherein:

the first calculating circuit comprises an accumulator and an adder;

the modifying circuit comprises a fourth register for storing a value which is different from the value  $A$ , and a selector for selecting one of the values stored in the first and fourth registers according to the output of the subtractor; and

the adder adds the value stored in the accumulator to the output of the selector.

18. The digital circuit claimed in claim 14, wherein the  $C/B$  represents a repeating decimal.